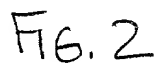
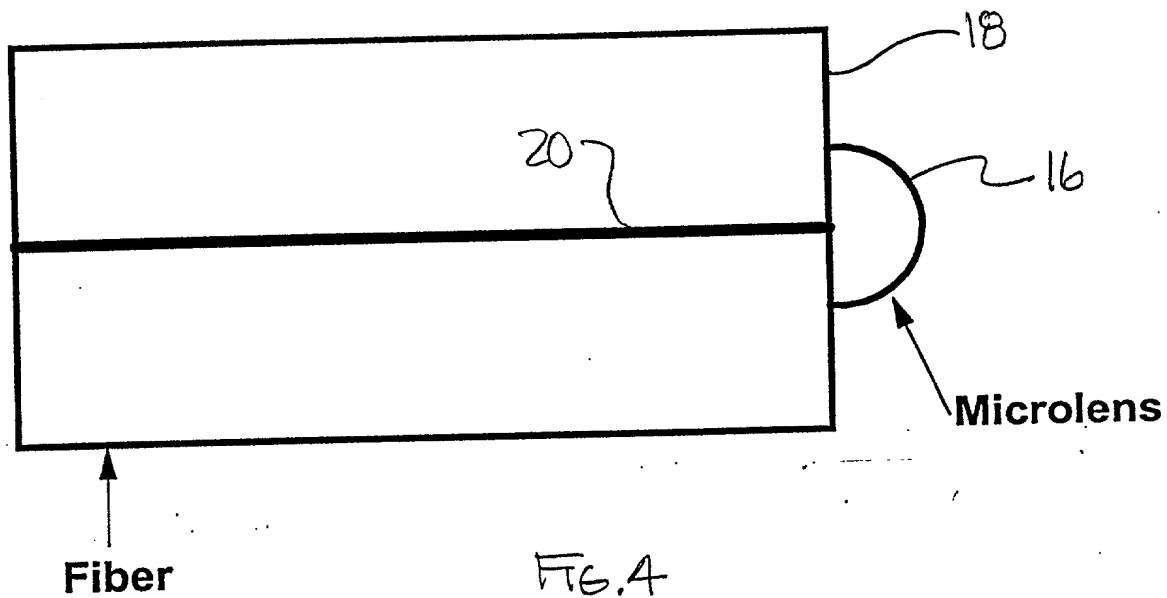


The diagram illustrates the operation of a drop-on-demand inkjet printer. It shows a **Driver** block that receives **Character Data** and sends a **Data Pulse Train** to a **Transducer**. The transducer is part of an ink chamber that also receives **Ink at atmospheric pressure**. The chamber has an **Orifice** at the front. The data pulse train causes the transducer to create pressure pulses in the ink, which are then ejected as droplets. A series of five droplets is shown moving from the orifice towards a vertical line representing **Paper**. The droplets are numbered 1 through 5, with a handwritten '10' above the fifth droplet, indicating a sequence of droplets forming a character.

Sketch of Droplet Formation & Ejection from Ink-Jet Printing Device



Microlens Printed on Tip of Single-Mode Fiber to Increase Numerical Aperture



Print N1 Material (print head #1)

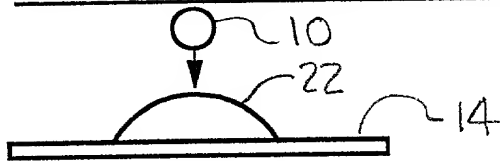


FIG. 5

Single-Index Lens

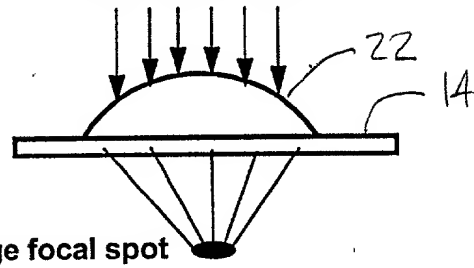


FIG. 8

Print N2 Material (print head #2)

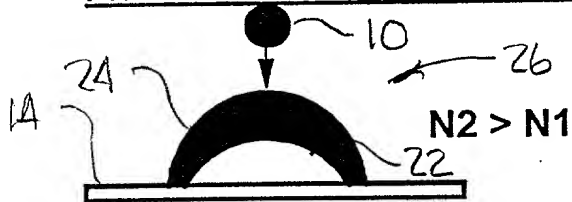


FIG. 6

Gradient-Index Lens

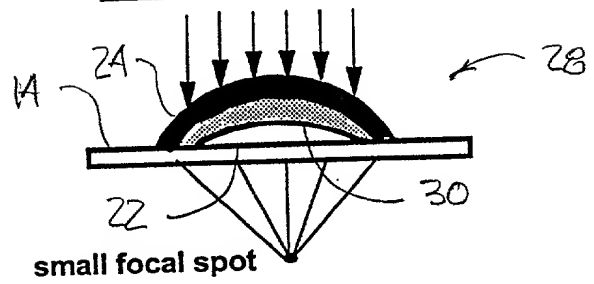


FIG. 9

Diffuse and UV-Cure

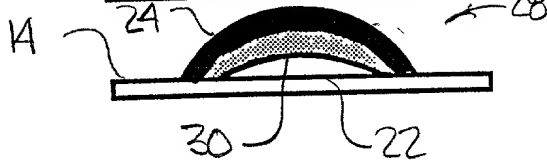


FIG. 7

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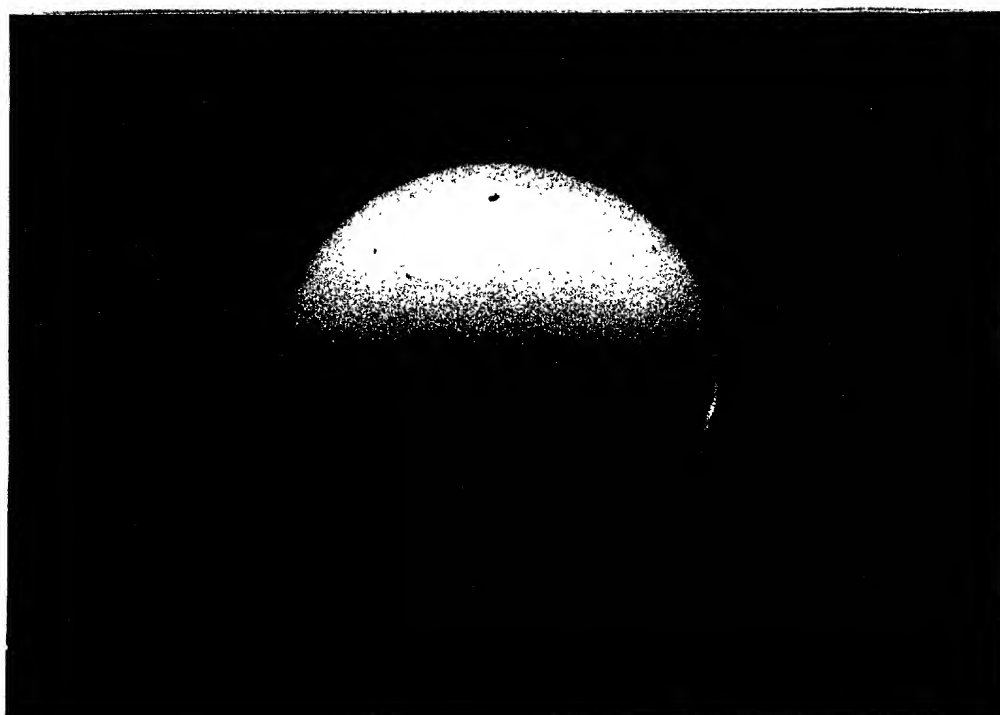


FIG. 11

LENS MATERIALS ISSUES

A. PRE-PRINT FLUID PROPERTIES

MICROJETTING

- VISCOSITY VS. TEMPERATURE
- SURFACE TENSION
- NEWTONIAL BEHAVIOR

LENS FORMATION

- SUBSTRATE WETTING
- MISCIBILITY OF FLUIDS
- STABILIZATION & CURING
- PROCESS REPEATABILITY

B. PRINTED LENS PROPERTIES

OPTICAL PERFORMANCE

- INDEX SPREAD
- GRADIENT SMOOTHNESS
- OPTICAL TRANSPARENCY

ENVIRONMENT ISSUES

- MECHANICAL HARDNESS
- TEMPERATURE STABILITY
- HUMIDITY STABILITY

FIG. 12